

Application No.: 10/621,755
Amendment Under 37 C.F.R. § 1.116 dated June 25, 2007
Final Office Action dated: April 27, 2007

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

Claims 1-10 (cancelled).

11. (Currently Amended) A method for an optimal one-shot phase and frequency estimation for timing acquisition for signals transmitted over a communications channel, the method comprising:

sampling a preamble comprising a known string of data bits;
estimating the sampled preamble (\bar{Y}), the estimated preamble further comprising an estimated amplitude (\hat{A}), an estimated frequency (\hat{f}), and an estimated phase ($\hat{\Phi}$);
calculating a cost function ($C(\hat{f}, \hat{\Phi})$) as a function of the estimated frequency (\hat{f})
and the estimated phase ($\hat{\Phi}$);
varying at least one of the estimated frequency (\hat{f}) or estimated phase ($\hat{\Phi}$) to calculate a plurality of cost functions; and

selecting the cost function ($C(\hat{f}, \hat{\Phi})$) having a minimum value, wherein said cost function having the minimum value is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$)
The method of claim 1, wherein selecting the minimum value cost function further comprises selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated frequency (\hat{f}).

12. (Original) The method of claim 11, wherein selecting the minimum value cost function further comprises selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$).

13. (Currently Amended) The method of claim [4]11, wherein selecting the minimum value cost function further comprises selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated phase ($\hat{\Phi}$).

14. (Original) The method of claim 13, wherein selecting the minimum value cost function further comprises selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$).

Claims 15-24 (cancelled).

25. (Currently Amended) A communications channel for an optimal one-shot phase and frequency estimation for timing acquisition for signals transmitted over the communications channel, the communications channel comprising:

a sampler for sampling a preamble comprising a known string of data bits;
a first calculator for estimating the sampled preamble (\vec{Y}), the estimated preamble further comprising an estimated amplitude (\hat{A}), an estimated frequency (\hat{f}), and an estimated phase ($\hat{\Phi}$);

a second calculator for calculating a plurality of cost functions ($C(\hat{f}, \hat{\Phi})$) as a function of the estimated frequency (\hat{f}) and the estimated phase ($\hat{\Phi}$) by varying at least one of the estimated frequency (\hat{f}) or estimated phase ($\hat{\Phi}$); and

a selector for determining the cost function ($C(\hat{f}, \hat{\Phi})$) having a minimum value, wherein said cost function having the minimum value is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$). The communications channel of claim 15, wherein the selector determines the minimum value cost function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated frequency (\hat{f}).

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26. (Original) The communications channel of claim 25, wherein the selector determines the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$).

27. (Currently Amended) The communications channel of claim [15]25, wherein the selector determines the minimum value cost function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated phase ($\hat{\Phi}$).

28. (Original) The communications channel of claim 27, wherein the selector determines the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$).

Claims 29-38 (cancelled).

39. (Currently Amended) A disk drive system for an optimal one-shot phase and frequency estimation for timing acquisition for signals transmitted over a communications channel, the system comprising:

rotating magnetic media for storing data;

a motor for rotating the magnetic media;

a recording head for transmitting data;

an actuator for positioning the recording head; and

a communications channel for communicating data to be stored on or read from the recording media, wherein the communications channel further comprises a sampler for sampling a preamble comprising a known string of data bits, a first calculator for estimating the sampled preamble (\bar{Y}), a second calculator for calculating a plurality of cost functions ($C(\hat{f}, \hat{\Phi})$) as a function of the estimated frequency (\hat{f}) and the estimated phase ($\hat{\Phi}$) by varying at least one of the estimated frequency (\hat{f}) or estimated phase ($\hat{\Phi}$), and a selector for determining the cost function

$(C(\hat{f}, \hat{\Phi}))$ having a minimum value, wherein said cost function having the minimum value is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase $(\hat{\Phi})$, and wherein the estimated preamble further comprises an estimated amplitude (\hat{A}) , an estimated frequency (\hat{f}) , and an estimated phase $(\hat{\Phi})$. The system of claim 29, wherein the selector determines the minimum value cost function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated frequency (\hat{f}) .

40. (Original) The system of claim 39, wherein the selector determines the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase $(\hat{\Phi})$.

41. (Currently Amended) The system of claim [29]39, wherein the selector determines the cost minimum value function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated phase $(\hat{\Phi})$.

42. (Original) The system of claim 41, wherein the selector determines the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase $(\hat{\Phi})$.

Claims 43-52. (Cancelled)

53. (Currently Amended) A communications channel for an optimal one-shot phase and frequency estimation for timing acquisition for signals transmitted over the communications channel, the communications channel comprising:

a means for sampling a preamble comprising a known string of data bits;

a means for estimating the sampled preamble (\bar{Y}), the estimated preamble further comprising an estimated amplitude (\hat{A}), an estimated frequency (\hat{f}), and an estimated phase ($\hat{\Phi}$);

a means for calculating a plurality of cost functions ($C(\hat{f}, \hat{\Phi})$) as a function of the estimated frequency (\hat{f}) and the estimated phase ($\hat{\Phi}$) by varying at least one of the estimated frequency (\hat{f}) or estimated phase ($\hat{\Phi}$); and

a means for selecting the cost function ($C(\hat{f}, \hat{\Phi})$) having a minimum value, wherein said cost function having the minimum value is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$). ~~The communications channel of claim 43, wherein means for selecting selects the minimum value cost function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated frequency (\hat{f}).~~

54. (Original) The communications channel of claim 53, wherein the means for selecting selects the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$).

55. (Currently Amended) The communications channel of claim [43]53, wherein the means for selecting selects the minimum value cost function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated phase ($\hat{\Phi}$).

56. (Original) The communications channel of claim 55, wherein the means for selecting selects the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$).

Claims 57-66. (Cancelled)

67. (Currently Amended) A computer program product encoded with a computer program for performing a method for an optimal one-shot phase and frequency estimation for timing acquisition for signals transmitted over a communications channel, the method comprising:

sampling a preamble comprising a known string of data bits;
estimating the sampled preamble (\bar{Y}), the estimated preamble further comprising an estimated amplitude (\hat{A}), an estimated frequency (\hat{f}), and an estimated phase ($\hat{\Phi}$);

calculating a cost function ($C(\hat{f}, \hat{\Phi})$) as a function of the estimated frequency (\hat{f}) and the estimated phase ($\hat{\Phi}$);

varying at least one of the estimated frequency (\hat{f}) or estimated phase ($\hat{\Phi}$) to calculate a plurality of cost functions; and

selecting the cost function ($C(\hat{f}, \hat{\Phi})$) having a minimum value, wherein said cost function having the minimum value is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$). The computer program product of claim 57, wherein selecting the minimum value cost function further comprises selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated frequency (\hat{f}).

68. (Original) The computer program product of claim 67, wherein selecting the minimum value cost function further comprises selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$).

69. (Currently Amended) The computer program product of claim [57]67, wherein selecting the minimum value cost function further comprises selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated phase ($\hat{\Phi}$).

70. (Original) The computer program product of claim 69, wherein selecting the minimum value cost function further comprises selecting a second minimum cost function from the plurality

of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$).

Claims 71-80. (Cancelled)

81. (Currently Amended) A disk drive system for an optimal one-shot phase and frequency estimation for timing acquisition for signals transmitted over a communications channel, the system comprising:

means for storing data;

means for rotating the means for storing;

means for transmitting data to and from the means for storing;

means for positioning the means for transmitting data; and

means for communicating data to be stored on or read from the means for storing, wherein said means for communicating further comprises means for sampling a preamble comprising a known string of data bits, means for estimating the sampled preamble (\bar{Y}), means for calculating a plurality of cost functions ($C(\hat{f}, \hat{\Phi})$) as a function of the estimated frequency (\hat{f}) and the estimated phase ($\hat{\Phi}$) by varying at least one of the estimated frequency (\hat{f}) or estimated phase ($\hat{\Phi}$), and means for determining the cost function ($C(\hat{f}, \hat{\Phi})$) having a minimum value, wherein said cost function having the minimum value is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$), and wherein the estimated preamble further comprises an estimated amplitude (\hat{A}), an estimated frequency (\hat{f}), and an estimated phase ($\hat{\Phi}$). ~~The system of claim 71, wherein the means for selecting determines the minimum value cost function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated frequency (\hat{f}).~~

82. (Original) The system of claim 81, wherein the means for selecting determines the minimum value cost function by selecting a second minimum cost function from the plurality of

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first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$).

83. (Currently Amended) The system of claim [74]81, wherein the means for selecting determines the cost minimum value function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated phase ($\hat{\Phi}$).

84. (Original) The system of claim 83, wherein the means for selecting determines the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency (\hat{f}) and an optimal estimated phase ($\hat{\Phi}$).